UMANSKIY, YA.P.

UMANSKIY, Ya.P., starshiy nauchnyy sotrudnik

Absorption of drugs in inhalation therapy in dogs when the central nervous system is subjected to varied influences. Vest. oto-rin. 16 no.3:10-17 My-Je '54. (MLRA 7:7)

1. Iz Ukrainskogo nauchno-issledovatel'skogo instituta bolezney ukha, gorla i nosa (dir. dotsent A.P.Kolibaba)
(BROMIDES, effects,
*on absorp. of drugs in inhalation ther. in dogs)
(CAFFEINE, effects,
*on absorp. of drugs in inhalation ther. in dogs)
(INHALATION THERAPY,
*eff. of bromides & caffeine on absorp. of drugs in dogs)

UMANSKIY, Ya.P., starshiy nauchnyy sotrudnik

Sulfonamide, antibiotic, and phytoncide inhalation therapy of acute anginas and chronic tonsillitis. Vest.oto-rin. 17 no.2:24-29 Mr-Ap '55. (MLRA 8:7)

1. Iz Ukrainskogo nauchno-issledovatel'skogo instituta bolezney ukha, gorla i nosa (dir. dotsent A.P.Kolibaba).

(TONSILLITIS, therapy,
antibiotics, phytoncides, & sulfonamides, inahlation ther.)
(INHALATION THERAPY, in various diseases,
antibiotics, phytoncides & sulfonamides in tonsillitis)
(ANTIBIOTICS, therapeutic use,
tonsillitis, inhalation ther.)
(SULFONAMIDES, therapeutic use,
tonsillitis, inhalation ther.)
(PLANTS,
phytoncides, ther. of tonsillitis, inhalation ther.)

UMANSKIY, YA. P.;

UMANSKIY, Ya.P.; PRIKHOD'KO, Ye.I.

Inhalation of penicillin aerosols as a method for preventing otitis in scarlet fever; abstract. Pediatriia 40 no.1:35-36 Ja '57. (MIRA 10:1)

1. Iz Ukrainskogo nauchno-issledovatel'skogo instituta bolezney ukha, gorla i nosa (dir. - dotsent A.P.Kolibaba) i kafedry detskik infektsiy Khar'kovskogo meditsinskogo instituta (dir. - dotsent I.. Kononenko)
(SCARLET FEVER) (EAR--DISEASES) (PENICILLIN)

UMANSKIY, Ya. P., kand. med. nauk; TRUTNEVA, T. I.

Pneumosinus of the frontal sinus. Vest. otorin. no.5:82-83 '61. (MIRA 14:12)

1. Iz otdeleniya bolezney ukha, gorla i nosa (zav. - kandidat meditsinskikh nauk Ya. P. Umanskiy) 30-y Gorodskoy klinicheskoy bol'nitsy, Khar'kov.

(FRONTAL SINUS--DISEASES)

PROCESSES AND PROPERTIES INDEX

Cr

X ray investigation of inner strains in hardened cobalt steels Ya. Lipmanskii and V. F. Gordon. *J. Tech. Phys.* (U. S. S. R.) **2**, 5[illegible] 9(1932).—Thirty % Co steels after hardening show a highly deformed lattic[illegible] stru[illegible]are of martensite. F. H. Rathmann

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BC

Dispersion of X-rays by nickel. II. Relationship between the intensity of the diffraction lines and the temperature. J. UMANSKI and V. VEXLER (Physikal. Z. Sovietunion, 1935, 7, 336—342).—The intensity of the (311) diffraction line of Ni has been measured in the temp. range 290—740° abs. The intensities observed at 480° and 590° abs. differ only slightly from those calc. by means of Waller's formula. Divergences at higher temp. are discussed. O. J. W.

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M

Shdanow, German Stepanowitsch and Ia. S. Umanski. *The X-Ray Study of Metals. Part I.* [In Russian.] Pp. 37ll. 1937. Moscow and Leningrad: Onti. (Rbl. 5.50.)

COMMON ELEMENTS

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2ND LETTER

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M

Zhdanov, G. S., and Ia. S. Umanski. *The X-Ray Study of Metals.* Part II. [In Russian.] With the collaboration of A. I. Liubimtsev, P. G. Orlov, and Ia. D. Sellski. Pp. 388. 1934. Moscow and Leningrad: Gonti. (Bbl. 6.)

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9

X-ray investigations of restitution phenomena. Ya. S. Umanskii. *Sbornik Nauch. Trudov Moskov. Inst. Tsvetnykh Metal. i Zol.* 1938, No. 5, 86-94; *Khim. Referat. Zhur.* 1, No. 11-12, 98(1938).—Cold-drawn wires of electrolytic Cu and of technical Al 2.5 mm. in diam. were heat-treated, etched to 0.5 mm. and examd. by x-rays. Heating of the Cu wire at 100° for 1 hr. causes a considerable decrease of inner strains of the 2nd kind, and does not affect appreciably strains of the 3rd kind. The weakening of lines caused by distortion was almost 1.5 times as great as found by Brindley and Spiers (cf. *C. A.* 29, 2414[9]), but was smaller than given by Mark and Rengstenberger. The heating of Al at a temp. considerably below the temp. of the beginning of recrystn. decreases partially the inner strain of the 3rd kind. The latent energy of the lattice distortion was detd. by using the analogy with distortions caused by heat motion of the atoms. A scheme is presented which illustrates the supposed mechanisms of restitution phenomena. W. R. Henn

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ca

Phase analysis of a mixture of tungsten and the carbides WC and W_2C by means of x-rays. Ya. S. Umanskii and S. S. Khidekel. *Zavodskaya Lab.* 8, [illegible] The quant. analysis of phases by x-ray methods of (1) homologous pairs, (2) mixing of unknown and standard samples and (3) independent standard sample is discussed and the applications and limitations of the methods are pointed out. The third method as modified by Sekito was used in the analysis of mixts. contg. 2 phases (W + WC, W + W_2C, and WC + W_2C). Al foil served as a standard for the W + WC while a foil of α-brass contg. 24.75% Zn served for the mixts. W + W_2C and WC + W_2C. A Muller electron tube having a Cu anode and Lindeman windows served for filming. Agfa-Laue x-ray films were used. Each film was developed for 3 min. at 18°. In detg. the W content in W + WC mixts. contg. up to 50% W the max. error did not exceed 2.5% W while for mixts. contg. W_2C the max. deviation in abs. percentage of W_2C compn. was about 5. The decreased accuracy is due to the hexagonal lattices of WC and W_2C. The accuracy can be increased by changing to smaller Bragg angles. The sensitivity and accuracy of the method can be increased by compressing the mixts. into cylindrical tubes 10 mm. instead of 5 mm. and by using the unmodified form of the Sekito method. B. Z. Kamich

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The Nature of Electrodeposited Silver-Cadmium Alloys. Yu. N. Umansky
and V. I. Layner (*Sbornik Nauch. Trudov Moskov. Inst. Tsvet. Metallov*
Zolota, **1940**, (8), 95–98; *Khim. Referat. Zhur.*, 1941, **4**, (3), 77; *C. Abs.*, 1943.
37, 4672).—[In Russian.] Silver-cadmium alloys were deposited at 18° C.
and c.d. of 0·5–3·5 amp./dm.² from an electrolyte containing silver 30 (in the
form of the cyanide complex), cadmium 15 (in the form of the cyanide com-
plex), free KCN 8, K_2SO_4 15, and $K_2C_4H_4O_6$ 7·5 grm./litre. Copper foil was
used as cathode and platinum as anode. Raising the c.d. increased the per-
centage content of cadmium in the deposit. X-ray analyses showed that the
lattices of the electrodeposited alloys were identical with those of alloys
obtained by crystallization from melts. However, in the region of the β
phase (silver 44–57%) there was found another phase, the β′ phase, with a
hexagonal lattice, stable at low temperatures.

COMMON ELEMENTS

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ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

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2

X-ray investigation of some columbium compounds.
Ya. S. Umanskii. *J. Phys. Chem.* (U. S. S. R.) 14, 332-9
(1940).—A sample of Cb contg. 0.42% of H gave patterns
corresponding with two isometric space-centered lattices
with spacings 3.300-3.306 A. and 3.416-3.430 A., the first
belonging to Cb and the second presumably to CbH (not
yet known). The hydride spacings disappear after heating
in vacuum at 800°. Cb nitride (8.8% of N) has a hexag-
onal lattice, $a = 3.017$, $c = 5.580$ A. Cb carbides form
face-centered cubes; the spacing increases from 4.305 A.
for 2.5% of C to 4.468 A. for 10.9% of C, but the increase
is irregular, suggesting the presence of two carbides (Cb_4C
or Cb_2C, and CbC or Cb_4C_3). The results of Becker and
Ebert (*C. A.* 49, 1643) are disproved. B. C. P. A.

Lab. of Structural X-Ray Analysis, Central Sci. Res. Electrical Engineering Lab.; Hard-alloys Combine

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

Zhdanov, G. S., and **Ya. S. Umanskiy**, *X-Ray Metallography*. Part I. Second edition. [In Russian.] Pp. 392. 1941. Moscow and Leningrad: Metallurgizdat. (13.50 Rbl.)

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Ca

X-ray study of titanium carbide. Ya. S. Umanskiĭ and S. S. Khidekel. *J. Phys. Chem.* (U. S. S. R.) 15, 983-90 (1941).—Samples of TiC were prepd. in various ways and subjected to x-ray analysis. Those prepd. in a Tammann furnace in a stream of H are up to 22 at. % deficient in carbon, but contain sufficient O and perhaps N to fill all places in the crystal lattice. Those prepd. *in vacuo* [are] also deficient in C; the no. of empty places is equal to the no. of O atoms for samples obtained by reduction of TiO_2, 5 to 8 times as great for those obtained from the hydride. The lattice distance varies from 4.321 for pure TiC to 4.204 for TiC with only 20 at. % of C.

P. H. Rathmann

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2

X-ray study of complex titanium tungsten carbides. Ya. S. Umanskii and S. S. Khidekel. *J. Phys. Chem.* (U. S. S. R.) 15, 997-1001(1941).—TiC and WC were fused or sintered together in various proportions. X-ray measurements showed only modified lattices of the simple carbides but no evidence of the formation of any double carbides such as $W_2Ti_4C_4$. The lattice period of TiC is decreased from 4.318 to 4.25 A. as the amt. of WC in the mixt. increases to 91.8% molar. On increasing the temp. from 1500 to 2700°, the amt. of WC in the homogeneous phase increases from 44 to 91.8 molar % (72 to 97 wt. %). With carbides deficient in carbon, addn. of WC increases the lattice distance of TiC. This is due to the reaction Ti + 2WC = TiC + W_2C taking place *in vacuo* at 1500°.

F. H. Rathmann

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2

Carbides of Solid Alloys and Related Substances. Ya. S. Umansky (*Izvest. Sekt. Fiziko-Khim. Anal.*, 1943, 16, (1), 127–148).—[In Russian]. A review, based on data in the literature and on U.'s own work. It covers metals of the transition group, the crystal structure of the embedded phases, the chemical linkage in the embedded phases, and the state of the non-metallic atoms.—N. A.

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Study of the ternary carbide system CbC-TiC-WC. A. N. Koval'skii and Ya. S. Umanskii. *J. Phys. Chem.* (U.S.S.R.) 20, 929-33(1946)(in Russian); cf. preceding abstr.—The region of one-phase system within the triangle formed by CbC, TiC, and WC is outlined by x-ray investigation of ternary mixts. melted together and then annealed at different temps. At 2500° the boundary of the one-phase region connects the points WC 75, CbC 25, and WC 92, TiC 8 mol. %, and at 1800°, the points WC 15, CbC 85, and WC 20, TiC 80. At higher WC contents a second phase appears which is WC contg. up to 1% of CbC and(or) TiC. The lattice spacing of the (hypothetical) pure WC must be 4.18-4.22 A. The nearer is the spacing of another carbide to this value, the greater is the soly. of WC in this carbide. The mineral loparite contains Cb and Ti in the mol. ratio 1:1. The Cb-Ti alloy obtained from it can be transformed into CbC + TiC and used for alloying with WC; this saves about 1/3 of the W.

J. J. Bikerman

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9

Ca

Umanskii, Ya. S.: Karbidy tverdykh splavov. Moscow: Sci. Tech. Literature Ferrous & Nonferrous Metallurgy. 1947. 131 pp.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

UMANSKIY, YA.S.

(The role of physics in metallography; a verbatim report of a public lecture)

Moskva (pracda) 1948. 23 p. (51-15476)

UMANSKIY, YA.S.

21763 UMANSKIY, YA. S. Nekotoryye priuiny obrazovaniya metastabil'nykh faz. Sbornik (Mosk. IN-T stali Im. Stalina), 28, 1949, S. 160-79 -- Bibliogr: 27 Nazv.

SO: Letopis'Zhurnal'nykh Statey, No. 29, Moskva, 1949

UMANSKIY, YA.S.

(The utilization of powder metallurgy in modern technology)

Moskva (pravda) 1950. 21 p. (51-15477)

TN695.U48

L'VOVSKAYA, V. P. and UMANSKIY, Ya. S.

"Certain Peculiarities of the Decomposition of Complex Titanium-Tungsten Carbide," Zhurnal Tekhnicheskoy Fiziki, Vol. 20, pp 1167-1174, No. 10, Moscow, 1950.

UMANSKIY, Ya. S., TRAPEENIKOV, A. K. and KITAYGORODSKIY, A. I.

Rentgenografiia (X-Rays Applied to the Industry), 310 p., Moscow, 1951.

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CA

Structure and composition of iron-tungsten carbides.
Ya S. Umanskii and N. T. Chebotarev (Moscow Steel
Inst.). *Izvest. Akad. Nauk S.S.S.R., Ser. Fiz.* 15, 24-38
(1951).—Fifty-four pressed samples of 3 g. each were prepd.
by mixing W powder, electrolytic Fe, and WC. The sam-
ples were sintered or made molten by (a) in vacuum at
1300-1350°, (b) at 1500-1800° with annealing at 1350°,
(c) in boats placed in a high-frequency induction oven.
Three different carbides (phases K_1, K_2, K_3) were dete[illegible]ted
by x-ray analysis. Phase K_1 has an equil. compn. [illegible]
W_3C but C and Fe:W ratio can vary considerably; [illegible] at-
tice period varies from 11.050 to 11.125 A. The ph[illegible] K_1
corresponds to the formula Fe_3W_3C. It can app[illegible] to-
gether with phase I or the compd. Fe_7W_6. An elementary
cell of phase K_1 contains 24 mols., an elementary cell of
phase K_3 8 mols. The cubic lattices can belong to one of the
symmetry groups O_h^7, O^4, and T_d^2. The W atoms are in the
positions of the complex 48(f), the Fe atoms are in the com-
plex positions 32(e) and 16(d), the C atoms occupy in K_1
the positions 8(a) and in K_3 the positions 8(a) and 16(c).
The introduction of C atoms in the octahedric pores between
the W atoms is necessary for the stability of Fe-W-C struc-
tures. The W, therefore, is the actual carbide-forming
element and the Fe can be replaced by Co and Ni. The
parameters of the lattice structure are calcd. and the calcd.
values of line intensities in the x-ray picture are compared
to exptl. values. S. Pakswer

UMANSKIY, YA. S.

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UMANSKIY, YA. S., B. N. FINKEL'SHTEYN, M. YE. BLANTER, S. T. KISHKIN, N. S. FASTOV and S. S. GORELIK.
FIZICHESKIYE OSNOVY METALLOVEDENIYA (Principles of physical metallurgy). Metallurgizdat, 1955. 724 p., diagrs., tables, photos. 10,000 copies printed.

ANALYSIS AND EVALUATION:
This book on physical metallurgy is compiled by a group of prominent Soviet scientists and is based on a very voluminous literature, monographic and periodical, mostly by Soviet writers. It is not a textbook but an outline of present-day achievement in the understanding of the physical principles of metallography and a survey of physical metallurgy problems as seen by Soviet scientists. Two main problems of theoretical physical metallurgy are emphasized: the theory of phase structure and the theory of phase formation. Presented in addition are the present-day concepts concerning plastic deformation of metals, recovery and recrystallization, and finally a study of the connection between the structure and composition of alloys and their strength.

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UMANSKIY, YA. S., B. N. FINKEL'SHTEYN,. . . Fizicheskiye. . .

The book is intended for metallurgical engineers and scientific workers, but could be used also by students specializing in physical metallurgy.

Chapter I (p. 7-110). Outlined are: present-day concepts of the atom, chemical bonds (covalent bonding and ionic bonding), metallic state of matter, crystalline structure of metallic and of some non-metallic elements, structure of covalent crystals. The treatment of the subject is similar to that found in present textbooks on nuclear physics.

Chapter II (p. 111-143). Solid solutions of the substitutional, and interististial types and those having lattices with vacant sites (subtraction solid solutions or a defect lattices) are discussed. Analysed is the lattice spacing distortion arising in some substitutional solid solutions because of the differences in size of the diameters of atoms of the common lattice of the solvent and solute. Mentioned are experiments conducted by Ya. S. Umanskiy and Ye. A. Gordon with cobalt-containing steel where such distortions were found to be most noticeable. The results of experiments made by Ya. S. Umanskiy, Ye. S. Makarov, S. S. Khidekel', and A. Kh. Breger are presented, in which various alloys were analysed in order to determine the type of solid solutions they formed and the changes which occured in their lattice spacings. Next the problem of mutual solubility of metals is discussed. A table of binary alloy systems with unlimited mutual solubility is given and conditions for forming continuous series of substitutional solid solutions are analysed. The influence of the interior free energy of a crystalline lattice on the mutual solubility of metals has been investigated by S. T. Konobeyevskiy, I. M. Lifshits, B. Ya. Pines, I. L. Aptekar' and B. N. Fil'kenshteyn. Changes in the state of atoms and the mutual reaction between dissimilar atoms which take place when a solid solution is formed have been studied by Ya. G. Dorfman, I. K. Kikoin, V. I. Prosvirin and others.

Chapter III (p. 144-245). The intermetallic compounds (intermediate constituents or intermediate phases) are examined. The following types of these compounds are analysed: 1) Ordered solid solutions based on the space lattice of one of the constituents, 2) Electron compounds, 3) Phases with nickel-arsenide structures, 4) Phases with structures like $MgCu_2$,

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$MgZn_2$ and $MgNi_2$, 5) Interstitial phases and the metallic carbides related to them, 6) Sigma phases.

The ordered solid solutions (superlattices) are described first, their main types outlined, and a table of investigated superlattices given (based on FCC and BCC). The partly-ordered solid solutions (due to concentration, temperature and plastic deformation) are analysed.

The thermodynamic theory of the process of ordered distribution as advanced by I. M. Lifshits is presented.

The nature of electron compounds is described, their crystalline structure and chemical composition outlined, and a table of known electron compounds is given. The theory of electron compounds based on quanta as advanced by S. T. Konobeyerskiy is presented. Electron compounds are analysed in binary systems and in some three-constituent alloys.

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Phases with compositions according to the formula AB_2 (Laves phases), i.e., size factor compounds where the difference in atomic diameters is about 20 to 30%, are presented and the research work of N. V. Belov, G. B. Bokiy and E. Ye. Vaynshteyn is mentioned.

Sigma phases of the ferritic high chromium-nickel alloys are described. Results of experimental research of sigma phase occurences in some binary and ternary alloys and their characteristics are given with a table of the regions in which sigma phases exist in various systems.

Phases with nickel-arsenide space lattices and similar structures are outlined and results of experiments made by Ye. S. Makarov to determine various characteristics of such structures are presented.

The discussion on interstitial phases starts with the classification of carbides, nitrides, hydrides and borides of metals. The description of the crystalline structure of interstitial phases is supplemented with a table of such structures. Mutual solubility of interstitial phases is discussed and the results of tests made by many Soviet scientists with a number of alloys are given. Some special physical properties of certain interstitial phases are analysed and are shown on tables: 1) Melting temperatures, electrical and magnetic properties of carbides and nitrides in the list of interstitial phases, 2) Hardness of some interstitial phases and their constituent metals and 3) Exothermic heat values at the formation of some carbides and nitrides. Some theories explaining the physical nature of interstitial phases, and the alloying of metals with non-metals are discussed. Some data are presented for simple and complex structures.

Chapter IV (p. 246-315). Deals with the crystallization from a liquid phase, with the general theory of phase formation and with the crystallization of one-phase alloys. The nature and atomic structure of molted metals and the characteristics of the liquid phase around the melting point are outlined and the results of x-ray analysis of the liquid phase as presented by A. I. Danilov are given. The principal parameters which characterize the

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kinetics of the process of crystallization in its different stages up to the formation of nuclei and their growth are outlined according to a formula developed by N. A. Kolmogorov. The general theory of the role of the equilibrium nuclei in a new phase formation as elaborated by Ya. I. Frenkel' is described and a table of the specific surface energy of some metals and of water is given. Next outlined is the formula presented by S. T. Konobeyevskiy (based on the theory of Gibbs) showing the influence of the size of a nucleus on the vapor tension developed over its surface and on the solubility. The probability in the formation of new equilibrium nuclei of a new phase is calculated on the basis of the principles of statistical physics. The influence of the dissolved impurities on the process of crystallization is analysed and various tests are mentioned when different admixtures are present. The influence of fixed boundary surfaces (such as walls of a container, suspended solid particles, etc.) on the phase formation is discussed. Outlined are results of tests showing the influence an overheated melt has on the nucleation process and on the inner structure of an ingot. The process of crystallization

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on an anisotropic base when crystallization occurs around oriented surfaces is analysed and the theory of such crystallization as advanced by P. D. Dankov is presented. Results of experiments conducted by various Soviet scientists are given.

Crystal growth is then discussed. A thermodynamic analysis of crystal growth and a formula elaborated by Ya. I. Frenkel' based on the theory of heterophase fluctuations are presented.

A calculation is next made of the number of nucleation centers based on the probability of three-dimensional nuclei growth through the formation on its faces of equilibrium nuclei which is followed by the calculation of the linear rate of crystal growth.

Chapter V (p. 316-343). Crystallization of heterogeneous alloys and the structure of real crystals.

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The crystallization of eutectic and other two-phase alloys is first analysed. Discussed are the difficulties presented in the crystallization process when the composition of the crystals differs from the composition of the liquid phase. The crystallization of eutectic alloys is explained according to the theory of A. A.Bochvar. His experimental research of this kind of crystallization and its theoretical analysis are outlined. Next, the formation of metastable phases during crystillization is discussed. The creation of metastable phases in connection with the influence of the surface energy of the nucleus is first examined and works of some Soviet metallurgists on this subject are mentioned. The presentation of the metastable crystallization on an anisotropic base follows and the formation of metastable phases during the crystallization of two-phase alloys is outlined. Finally, the crystallization of real alloys and the structure of real crystal such as dendrites, mosaics and crystallites are presented.

Chapter VI (p. 344-416). Heat motion of atoms in metallic crystals. The vibratory motions of atoms in a space lattice of a crystal are described and the formulae of Debye for the calculation of the heat energy, of the characteristic temperatures, and of the specific heat in crystals are presented. The theoretical calculations of Debye have lately been reappraised by a number of Soviet metallurgists and extensive experimental work has been done by Ya. S. Umanskiy, V. O. Veksler, V. I. Iverova, V. A. Il'ina, V. K. Kritskaya, G. V. Kurdyumov, S. M. Nikolayeva, A. Ye. Koval'skiy. Diffusion in metals and its basic laws are discussed next. A number of Soviet scientists working on this problem are mentioned and their writings on this subject listed.

The mechanics of diffusion in a solid and the dependence of temperature upon the diffusion coefficient are outlined on the basis of the work of many scientific researchers, especially A. F. Ioffe and Ya. I. Frenkel'.

The Kirkendall effect is discussed. Factors influencing the value of the diffusion coefficient are analysed, such as the nature of the diffused metal, the type of the solid solution, the composition and concentration of the solid solution, the crystalline structure of the solid solution, the anisotropy of the diffusion coefficient (dependent upon the crystallographic direction), the grain size (in boundary and surface diffusion), the distortion of the crystalline lattice, and the influence of a third component. The names and works of many Soviet scientists are quoted. As a final topic, diffusion accompanied with phase transformation and reactive diffusion are discussed.

Chapter VII (p. 417-501). Plastic deformation, recovery and recrystallization.

First the plastic deformation of monocrystals is discussed, namely: the slip process, deformation twinning, yield point, the influence of foreign particles, temperature and rate of deformation, on the yield point, the influence of oxide films on deformation, the influence of surface-active substances on deformation and the intermittent deformation hardening. Next the special features of the plastic deformation of polycrystalls are analysed, namely: grain boundary, deformation of polycrystalline material (as compared with monocrystalline), creep, the reinstatement of creep, and the Bauschinger effect. Finally, the mechanism of plastic deformation is described: the assumed structure of the plastically-deformed metal, the mechanism of the plastic deformation process, the dislocation theory (mainly based on the work of T. A. Kontorova and Ya. I. Frenkel'), and the energy of residual stresses (deformations). The study of recovery follows with the works of many Soviet scientists mentioned.

Recrystallization is outlined and the following problems are analysed: recrystallization of cold-worked metal, starting temperatures of recrystallization, nucleation of recrystallization, growth of new grains, rate of recrystallization, grain growth after recrystallization, and recrystallization diagrams.

Chapter VIII (p. 502-542). Transformation in the Solid State. Processes developing without change in the chemical composition of phases.

Two transformations are analysed: the allotropic and the martensitic, the latter of which is outlined in greater detail. Works of many Soviet scientists in this field are descirbed.

UMANSKIY, YA. S., B. N. FINKEL'SHTEYN, ... Fizicheskiye... AID 847 - M

steel), pearlite transformation in steel and the formation of acicular troostite (the mechanism of pearlite transformation, the kinetics of pearlite transformation, structure of steel that has undergone an eutectic decomposition, the transformation of austenite into acicular troostite or bainite).

Chapter X (p. 651-704). Structure of alloys and their strength. Theoretical and actual strengths of alloys are discussed and the interatomic bonds influencing the technical strength are presented with tables showing the bonding energy of most metals. The dependence of the strength of crystalline solids upon their inner structure is analysed. The mechanism of alloy strengthening is outlined and the strengthening effect of inner particles which block the plastic deformation is shown, as well as the influence of different kinds of loading on the alloy's strength.

The problem of steel strengthening by means of alloying, heat treatment and plastic deformation is discussed and data on a number of steels manufactured in the USSR are given.

UMANSKIY, YA. S., B. N. FINKEL'SHTEYN, ... Fizicheskiye... AID 847 - M

The final section deals with heat- and cold-resisting alloys. Their structure and main characteristics under various conditions are discussed. Some experiments and data on the heat-resisting alloys E1437 and E1481 are presented. This section unfortunately is treated very briefly.

At the end of the book a very voluminous literature is listed, mostly periodical articles of the total of 618 titles, 484 are Russian.

15/15

YELYUTINA, V.I., kandidat tekhnicheskikh nauk; UMANSKIY, Ya.S., professor, doktor.

Peculiarities of age hardening in beryllium bronze. Sbor.Inst. stali no.33:96-102 '55. (MLRA 9:6)

1.Kafedra rentgenografii.
(Copper-beryllium alloys) (X rays--Industrial applications)

UMANSKIY, YA. S.

E-1

Category : USSR/Solid State Physics - General Problems

Abs Jour : Ref Zhur - Fizika, No 3, 1957, No 6479

Author : Umanskiy, Ya.S.

Title : Importance of X-ray Diffraction to the Investigation of Alloys and to the Control of Technological Processes.

Orig Pub : Sovrem. metody ispytaniy materialov v mashinostroyenii. M., Mashgiz, 1956, 180-210

Abstract : No abstract

Card : 1/1

Umanskiy, Ya. S.

USSR/Solid State Physics - Structure of Deformable Materials. E-9

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 11863

Author : Bogorodskiy, O.V., Umanskiy, Ya.S.

Inst : Moscow Institute of Steel, USSR.

Title : Change in Fine Crystalline Structure of Austenitic Manganese Steel During Plastic Deformation.

Orig Pub : Izv. AN SSSR, ser. fiz., 1956, 20, No 6, 614-620

Abstract : The great strengthening observed in cold deformation of austenitic high-carbon steel (Hadfield steel) are explained. Hardened specimens were subjected to compression in a Gagarin press at a rate of 3 mm per minute. X-ray diffraction investigation has shown that as the degree of compression increases, one observes a rapid reduction in dimensions of the mosaic blocks and a growth in the microdeformations of the grains. The hardness increases sharply,

Card 1/2

MANSKIY V.

UMANSKIY, YA.S.

E-8

USSR / Structure of Deformed Materials.

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9398

Author : Gorelik, S.S., Umanskiy, Ya.S.
Inst : Moscow Steel ~~Institute~~, USSR
Title : X-ray-Diffraction Investigation of the Recrystallization of Certain High Melting Point Compounde.

Orig Pub : Izv. AN SSSR, ser. fiz., 1956, 20, No 6, 650-652

Abstract : A study was made of the relaxation and recrystallization of WC in NiAl. WC was first deformed by abrasion with a grinding wheel, and the hardening of NiAl was effected during the process of grinding the powder. A special test made on the iron showed that the above methods of deformation give the same effect, as shrinkage by 60 -- 70%. The time (τ) required for start of recrystallization was determined at various T (from 1350 to 1550° for WC and 700 -- 780° for NiAl). From the slope of the line $\ln\tau = f(1/T)$ it was possible to determine a quantity Q, which characterizes the tem-

Card : 1/2

E- 8

USSR / Structure of Deformed Materials.

Abs Jour : Ref Zhur - Fizika, No 4, 1957, No 9398

Abstract : perature dependence of the speed of the process: Q_{WC} = 115000 cal/mol, $Q_{\widehat{NiAl}}$ = 52,000 cal/mol. The ratio of the recrystallization temperature to the melting temperature for the above compounds amounts to 0.5 -- 0.6 in place of 0.2 — 0.35 for pure metals. From the change in the width of the line on the X-ray patterns the authors determined the occurrence of relaxation. In WC the relaxation occurs after three hours at 900° and in NiAl within one hour at 500°.

Card : 2/2

YA. S. I

UMANSKIY, J. YELUTINA, V., KAGAN, A., PRVOVAROV, L.

"X-Ray Diffraction Data on the Changes in Mosaics Caused by Disintegration" (Section 11-4) a paper submitted at the General Assembly and International Congress of Crystallography, 10-19 Jul 57, Montreal, Canada.

C-3,800,189

Umanskiy-Valovaja st. 4 fl. bl.
Yelutina, Kagan, and Pivovoarov, Moscow

x Umanskiy, Ya.S.

SAMSONOV, Grigoriy Valentinovich; UMANSKIY, Yakov Semenovich; RASTORGUYEV, L.N., redaktor; KAMAYEVA, O.M., redaktor izdatel'stva; ORMONT, B.F., professor-doktor, retsenzent; TRET'YAKOV, V.I., kandidat tekhnicheskikh nauk, retsenzent; MIKHAYLOVA, V.V., tekhnicheskiy redaktor.

[Hard compounds of metals with high melting-point] Tverdye soedineniia tugoplavkikh metallov. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1957. 388 p. (MLRA 10:6)

(Heat-resistant alloys)

UMANSKIY, Ya. S.; YELYUTINA, V.; KAGAN, A.; PIVOVAROV, I.

X-ray analysis of changes in the mosaic structure of aging beryllium bronze. Kristallografiia 2 no.4:503-507 '57. (MLRA 10:8)

1. Moskovskiy institut stali im. I.V. Stalina.
(Copper-tin-beryllium alloys--Metallography)

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001857930006-2"

411

the compound NiAl

SOV/163-58-1-20/53

AUTHORS: Zlatoustovskiy, D. M., Umanskiy, Ya. S.

TITLE: The Microstress and the Static Distortion of the Lattices in Cupped Steelwire (Mikronapryazheniya i staticheskiye iskazheniya reshetki v kholodnotyanutoy stal'noy provoloke)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 1, pp 104-110 (USSR)

ABSTRACT: The microstress and the static distortion of the crystal lattices of steelwire as dependent on the cupping rate and the force of deformation were investigated. The experiments were carried out with 08кп steel of pure ferrite structure (Composition: 0,08% C, 0,006% P, 0,025% S).
With the increase in the degree of deformation in the wire cupping processes a monotonous increase of the microstress is found.
From the diagrams it may be seen that the tensional deformation leads to a "saturation" of the crystal lattices with microstress and to static distortion.
The increase of the extension rate leads to a decrease of the microstress. The static distortion of the crystal lattice does not change with the increase in the extension rate. The dis-

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The Microstress and the Static Distortion of the Lattices in Cupped Steelwire

tribution of the microstress and the static distortion along the cross sections takes place comparatively uniformly with an increase in the rate of wire cupping.
It is assumed that in the case of higher extension rates the distribution of the stress increases.
There are 4 figures, 1 table, and 7 references, 5 of which are Soviet.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: October 1, 1957

Card 2/2

AUTHORS: Belikov, A. M., Umanskiy, Ya. S. SOV/163-58-1-35/53

TITLE: The Characteristic Temperatures of the Heat Vibration and the Thermal Expansion of Some High Melting Metallic Phases (Kharakteristicheskiye temperatury teplovykh kolebaniy i teplovoye rasshireniye nekotorykh tugoplavkikh metallicheskikh faz)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 1, pp 192-197 (USSR)

ABSTRACT: The inclusion phase in the alloy of molybdenum with niobium and titanium was investigated.
Nitrites of the above mentioned elements were produced according to the powder metallurgical method in the nitrogen flow at 1000 - 1200°C. In these investigations the lattice constant and the quantity of $m\ \theta^2$ of the composition of the alloys Mo-Nb and Mo-Ti were investigated. From the shape of the curves may be seen that with the solubility of titanium and niobium in molybdenum the quantity $m\ \theta^2$ varies in the case of a lower content of titanium or niobium in the alloys. This

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The Characteristic Temperatures of the Heat Vibration and the Thermal Expansion of Some High Melting Metallic Phases

variation of m Θ^2 explains the strong interaction between the atoms of titanium and especially of niobium with atoms of molybdenum rich alloys. The values for m Θ^2 of nitrites are equal to those values of pure metals.
From the investigation of the carbides TiC, ZrC, NbC and WC it may be seen that these compounds have the same combining power as metals.
In table 2 are given data on the combining powers and coefficients of linear expansion of the metals mentioned above, and their metallic phases such as NbN, ZrN, Ta_2N, TiC, Mo_2C and NbC. In the investigation of the carbides of molybdenum and tungsten as well as of all nitrites it was found that the constant of the heat vibrations changes only little as compared to pure iron.
It is assumed that in all phases the electrons of carbon actively effect the structure of the d-orbits of the metals of the fourth and fifth group. The electric conductivity of the carbides of molybdenum and tungsten is lower than the electric conductivity of pure molybdenum and tungsten metals.

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SOV/163-58-1-35/53

The Characteristic Temperatures of the Heat Vibration and the Thermal Expansion of Some High Melting Metallic Phases

There are 2 figures, 2 tables, and 9 references, 9 of which are Soviet.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: October 1, 1957

Card 3/3

UMANSKIY, YA. S.

129-3-3/14

AUTHORS: Umanskiy, Ya.S., Doctor of Technical Sciences, Professor, and Zlatoustovskiy, D.M., Engineer

TITLE: X-ray Investigation of the Lattice in Cold-drawn Steel Wire (Rentgenograficheskoye issledovaniye reshetki v kholodnotyanutoy stal'noy provoloke)

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, No.3, pp. 11 - 15 (USSR).

ABSTRACT: Various authors have observed an improvement in the mechanical properties of drawn wire with increasing drawing speed. The authors studied the micro-stresses and the static distortions in the crystal lattice of drawn steel wire as a function of the drawing speed and the reduction. For comparison, curves were drawn of the distribution of micro-stresses and of static distortions of the crystal lattice along the cross-section of wire which was deformed by tension. Investigations were carried out on 08KП steel. Steel with a purely ferritic structure, containing 0.08% C, 0.006% P and 0.025% S was chosen. After pickling and de-liming, 6.5 mm wire was drawn to obtain wire of 3.5 mm dia; this was annealed in muffle furnaces at 780 °C and pickled in the ordinary way. Then, the wire was drawn to 1.80 mm dia., again annealed and prepared for further drawing. This wire was then drawn on a Norton 6/350 stand with

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129-3-3/14

X-ray Investigation of the Lattice in Cold-drawn Steel Wire.

six differing drawing speeds (157.5, 205.5, 270, 350, 470 and 590 m/min.) to obtain a diameter of 1.60 mm. To study the influence of the reduction on the micro-stresses and the static distortions of the crystal lattice, wire of 3.23, 2.75, 2.40, 2.03 and 1.80 mm was produced from 3.50 mm dia. wire. All these were annealed and pickled simultaneously and then the wire blanks were drawn on the same drawing stand to the final diameter of 1.60 mm, using various overall reductions, as enumerated in the table on p.11. The graphs, Fig.1, give the dependence of micro-stresses and of the static distortions of the crystal lattice, whilst the distribution of the micro-stresses along the cross-section of the wire is graphed in Fig.2. It is concluded that during the process of drawing the wire with increasing degrees of reduction, a monotonous increase is observed of the micro-stresses, as a result of which the crystal lattice becomes saturated with static distortions. Tensile deformation leads to saturation of the crystal lattice with micro-stresses as well as with static distortions. Increase of the speed of drawing of wire brings about a decrease in the micro-stresses; the static distortions of the crystal lattice do not change with increasing drawing speeds. It is assumed that increase in the

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drawing speed leads to a partial elimination of the residual stresses due to relaxation phenomena. Static distortions of the crystal lattice and, similarly, the micro-stresses and the micro-hardness are distributed across the cross-section of the wire. Consequently, the hardening of the wire during deformation is due to micro-stresses and static distortions of the crystal lattice. With increasing drawing speeds, the distribution of the micro-stresses and of static distortions along the cross-section will be more uniform. At higher speeds of drawing, the stress distribution will become more uniform. However, for increasing the drawing speed, it is necessary to prepare more meticulously the tool and the wire surface prior to drawing and to lubricate for higher temperatures. There are 2 figures and 14 references, 12 of which are Russian, [redacted]ish and 1 German.

ASSOCIATION: Magnitogorsk Mining-metallurgical Institute imeni G.I. Nosov (Magnitogorskiy gorno-metallurgicheskiy institut imeni G.I. Nosova)

AVAILABLE: Library of Congress

Card3/3

SOV/163-58-3-37/49

AUTHORS: Astrakhantsev, S. M., Umanskiy, Ya. S.

TITLE: The Microporosity of Beryllium Oxide Powder (Mikroporistost' poroshka okisi berilliya)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 3, pp 226 - 230 (USSR)

ABSTRACT: Beryllium oxide produced in the thermal decomposition of complex compounds is characterized by the low bulk weight and the inferior pressing properties. The present paper deals with the investigation of the causes of the deterioration of the pressing properties of beryllium oxide. Beryllium oxide with a bulk weight of 0,107 g/cm^3 is pressed into briquets at a pressure of 1 - 1,5 t/cm^2. It was found that the amount of pressure applied does not change the properties of the pressed articles. The microporosity of the beryllium oxide sample was investigated as dependent on the sintering temperature. The main cause for the inferior pressing and the low bulk weight of beryllium oxide powder is the high microporosity of the sample. The decrease of the micropores begins at temperatures of 750^0 - 800^0, further increases to

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1250° - 1300°, and practically ends at 1600°. An increase of the density of beryllium oxide does not only bring about a decrease of the microporosity but also a change of the grain size. The properties of the initial beryllium were investigated by means of a small-angle x-ray analysis. There are 4 figures, 2 tables, and 4 references, which are Soviet.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: October 1, 1957

18(7), 18(4) SOV/163-58-4-31/47

AUTHORS: Pivovarov, L. Kh., ~~Umanskiy, Ya. S.~~

TITLE: X-Ray Analysis of the Changes of Dimensions of Blocks With Mosaic Structure in Aging (Rentgenoanaliz izmeneniy razmerov blokov mozaichnoy struktury pri starenii)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 4, pp 184 - 188 (USSR)

ABSTRACT: The changes of block dimensions in aging of the N36KhT and EI437A alloys and of duralumin were determined here by the method of investigating the intensities of near lines. On account of the investigation described here, the following was ascertained: The asymmetry of form of the lines (111) in hardened samples of the EI437A alloy can be explained by means of the data in the paper (Ref 10). These data say that in alloys near, by their composition, to this EI437A alloy decomposition already occurs in hardening and not in the whole volume of alloy. During such decomposition, this alloy shows individual sections with an increased lattice parameter. This causes an asymmetric extension of the (111)-lines in the direction of the small angles. In the continuous aging process (8 hours at 750° and 15 minutes at 880°), the decomposition

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X-Ray Analysis of the Changes of Dimensions of Blocks With Mosaic Structure in Aging

already takes place in the whole alloy volume, and the (111)-line becomes asymmetric.. The scattering of the intensity points of the hardened EI437A-alloy samples will have to be explained by the distinctly different grain (Ref 11) and probably by the different block dimensions according to the length of bar. As has been shown before in the paper (Ref 3), the increase in the intensity of near lines in aging occurs at the expense of block refinement.. An additional increase in hardness and intensity of the (111)-lines in the samples of the EI437A alloy in heating up to 750° with a preceding aging at 880° for one hour can be explained by the "preliminary decomposition" (doraspad) of the solid solution, causing a refinement of the blocks with mosaic structure of the solid solutions. A reduction of the intensity of the rear X-ray diagram lines in the aging of alloys can probably be explained by the development of dislocations. These dislocations are static distortions caused by the plastic deformation connected with the decomposition.
So far the cause of the intensity difference in the hardened duralumin samples has not been explained.

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X-Ray Analysis of the Changes of Dimensions of Blocks With Mosaic Structure in Aging

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As a summary, it is stated that - just as in previous papers on copper and nickel-beryllium alloys - also here a refinement of the blocks with mosaic structure of the solid solution occurs in aging. There are 4 figures and 13 references, 11 of which are Soviet.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: October 1, 1957

Card 3/3

SOV/149-58-6-13/19

AUTHORS: Astrakhantsev, S.M. and Umanskiy, Ya.S.

TITLE: Investigation of Microporosity in Certain Metals, Alloys and Oxide Powders by the Method of Small-angle X-ray Scattering (Issledovaniye mikroporistosti v nekotorykh metallakh, splavakh i proshkakh okislov metodom malougol'nogo rasseyaniya rentgenovskikh luchey)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Tsvetnaya Metallurgiya, 1958, Nr 6, pp 115 - 125 (USSR)

ABSTRACT: The authors studied the mechanism of the closure of micropores during heating of a number of refractory oxides and of the formation of pores during annealing of electro-deposited nickel and during distillation of zinc from brass. The method of small-angle X-ray scattering was used and the calculations were based on the formula given by Guinier and Fournet (Ref 5):

$$I_{PMY} = Nn^2 e^{-\frac{K^2 R_0^2}{3}} \qquad (1)$$

where: I_{PMY} - intensity of X-rays scattered at low angles by particles with the effective size R_0;

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Investigation of Microporosity in Certain Metals, Alloys and Oxide Powders by the Method of Small-angle X-ray Scattering

N - the number of sub-microscopic non-homogeneities participating in the small-angle scattering;

n - the difference between the electron densities of the non-homogeneous domains and of the matrix;

$K = 2\pi(\varphi/\lambda)$ (φ - angle of scattering, λ - X-ray wavelength). Tangent of the angle of the slope of the straight line:

$\lg I_{PMY} = f(\varphi^2)$ equal to $\alpha = 5.715\ R_o^2/\lambda^2$ was used for calculating R_o from the formula:

$$R_o = A \cdot \lambda \cdot \sqrt{\frac{\lg I_{PMY}}{\varphi^2}}$$

in which, for the experimental conditions employed, A was equal to 1 700. The collimation correction was introduced in the calculations by the method used by Filippovich (Ref 8), i.e. by means of graphs (reproduced

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in Figure 1) showing the actual size (Å) of the pores, $R_{\text{ОЦЗМ}}$ · R_{i} , as a function of the calculated value These graphs were plotted for Mo, Cu and Fe radiation (Figures 1, a, б and B, respectively), graphs 1, 2 and 3 corresponding to the ratio X_0/D equal to 0.0015, 0.0008 and 0.0004, respectively, where $2X_0$ - the width of the primary X-ray beam, D is the distance between the specimen and the radiation intensity counter. In the present investigation Cu radiation was mostly used with $X_0/D = 0.0008$. Before proceeding to study the effect of heating on the microporosity of Al_2O, B_2O and MgO powders, the authors proved that particles of these substances in the 1.5 - 3 μ size range produced the same small-angle X-ray pattern and that while the size of the original blocks of MgO and BeO was the same as that of the non-homogeneity domains, the rate of growth on heating was faster in the former than in the latter case (the effect

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of the temperature on the size of BeO and MgO powders is shown in Table 1). They proved also by means of pyknometric measurements the presence of micropores in the interior of single grains of these oxides, thus showing that the small-angle scattering produced by the investigated substances was, in fact, due to microporosity only. The composition of the experimental powders is given in Table 2 which shows also the optimum thickness (mm) of the specimens (converted to compact materials). The powders were heated in air, at temperatures ranging from 500 to 1 900 °C. After heating, specimens of the optimum thickness were prepared by pressing. The ionisation curves of the MgO powder heated for 15 min. at 1 - 800, 2 - 1 000, 3 - 1 300 and 4 - 1 500 °C are shown in Figure 2 (monochromatic Cu radiation was used - speed of the counter 0.5 °/min., speed of the film 9 600 mm/h, φ = 5). Figure 3 shows the variation of the average size, $\bar{R}_0$, of the micropores (in Å) and of the porosity, Π (in %), of oxides heated for 15 min at various temperatures :

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a) - Al_2O_3; b) - BeO (1 - FeK_α, 2 - CuK_α, 3 - MoK_α radiation); c) - MgO. The effect of the duration of heating (min) on $\bar{R}_0$ of the investigated oxides treated at a) - 1300 and b) - 800 °C is shown in Figure 4. Finally, the effect of temperature on the value of the ratio N_{kp}/N_m, where N_{kp} and N_m are, respectively, the numbers of large and small pores in powders heated for 15 min, is illustrated in Figure 5. Commenting on their results, the authors state that microporosity in oxide powders obtained by reduction or dissociation of more complex compounds can be attributed to the fact that they are obtained at comparatively low temperatures (30-40% of their melting points) at which the mobility of the atoms in the lattice is low. For this reason, when compounds of the $MgCO_3$ type dissociate, the evolved gas is driven off at a rate faster than that at which the crystal lattice of the oxide is formed. As a result, voids and lattice vacancies are present in the particles of oxide. Since

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the concentrations of vacancies near the large and small micropores are different, a diffusion current should develop (Ref 11) resulting in the growth of the large pores and elimination of the small ones, which has been confirmed by the results of the present work. In the case of electro-deposited nickel, the lattice irregularities are caused by excess atoms or by vacant lattice sites and are referred to (Ref 12) as "positive" and "negative" dislocations. When electrolytic nickel is annealed, coalescence of the vacancies should result in the formation of, at first, submicroscopic and, later, microscopic pores. Such an effect has been reported (Ref 13) but, since there was a possibility that the observed macroporosity was due to coalescence of crevices and voids formed during quenching or deformation, further study of this problem was undertaken by the present authors. The experimental X-ray specimens consisted of layers of Ni (5 - 7 μ thick) electro-deposited on both sides of copper supports (22 - 25 μ thick) from an electrolyte

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containing 75 g/l. $NiSO_4.(NH_4)_2.SO_4.6H_2O$, 15 g/l. NH_4Cl, and 15 g/l. H_3BO_3. No porosity was detected in the untreated specimens. The heat treatment consisted of heating the specimens in sealed quartz ampoules (vacuum approx. 10^{-3} mm Hg) for various periods at various test temperatures and quenching in water. The graphs representing function $\bar{R} = f(\tau^{1/2})$, where τ - duration of annealing (in min), for specimens annealed at 1 - 600, 2 - 700, 3 - 800, 4 - 850 °C are shown in Figure 6 (left) (points obtained for specimens annealed at 700 and 800 °C lie on the same line, i.e. pores formed at these temperatures were of the same size). The relationship between the small-angle effect, S, and the duration of annealing (min) for the same specimens is shown in Figure 6 (right). It will be seen that up to 800 °C S increased with increasing annealing time which indicated that at these temperatures the number of pores increased but not their size. At 850 °C, S rapidly decreased with increasing duration of the

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Investigation of Microporosity in Certain Metals, Alloys and Oxide Powders by the Method of Small-angle X-ray Scattering

treatment which indicated rapid growth of the pores. Since similar effects were obtained on Ni specimens deposited on nickel supports and on test pieces consisting of the electro-deposited layers detached from the supports, it was concluded that the main cause of the formation of pores during annealing of electro-deposited nickel is the relaxation of the lattice distortions (coalescence of vacancies). In the last stage of the investigation, the formation of pores in brass heated in vacuo was studied. Cold-rolled specimens (30-35 μ thick) of commercial quality brass L-62 were used for the measurements. The results are plotted in Figure 7 showing (on the left) R_0 as a function of $\tau^{1/2}$, and porosity Π, (%) as a function of τ, for specimens annealed in vacuo at 1 - 500, 2 - 600, 3 - 700 and 4 - 800 °C. It was concluded that when a volatile constituent is distilled off from an alloy, the formation of the pores is a diffusion process even in the early stages of the distillation and that at low temperatures the number of the pores can increase without an increase of their size due to coalescence.

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Investigation of Microporosity in Certain Metals, Alloys and Oxide Powders by the Method of Small-angle X-ray Scattering

There are 7 figures, 2 tables and 15 references, 12 of which are Soviet, 2 English and 1 French.

ASSOCIATION: Moskovskiy institut stali. Kafedra metallofiziki i rentgenografii (Moscow Institute of Steel. Chair of Metal Physics and Radiography)

SUBMITTED: June 23, 1958

Card 9/9

UMANSKIY, Ya.S.; PIVOVAROV, L.Kh.

X-ray method for investigating the mosaic structure of metals.
Zav. lab. 24 no.5:549-554 '58. (MIRA 11:6)
(X-ray crystallography)

UMANSKIY, YA. S.

PIVOVAROV, L.KH.; VARLI, K.V, [redacted]

"The Change of Mosiac Structure in the Process of Alloy Aging and Strengthining"

A report persented at Symposium of the International Union of Crystallography Lenningrad, 21-27 May 1959

SO: B 3,135, 471

18(3), 18(7) SOV/163-59-1-35/50

AUTHORS: Mirkin, L. I., Umanskiy, Ya. S.

TITLE: Interlinkage of the Elements of the Fine Structure of Metal- and Alloy Crystals During Consolidation by Means of Hardening and Plastic Deformation (Vzaimnaya svyaz' elementov tonkoy kristallicheskoy struktury metallov i splavov pri uprochnenii putem zakalki i plasticheskoy deformatsii)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1959, Nr 1, pp 179-181 (USSR)

ABSTRACT: This paper gives an account of the X-ray investigation of a plastically deformed ferritic steel (with 1.5 and 3% Mn), of the hardened steels 20, 18KhGT, 30KhGT and of low carbon Armco-type steel. The study was intended to provide information on the interlinkage of the fine structure elements. The diagrams obtained demonstrate that the increase in the distortions of second order to not correspond to a reduction, but to an increase in grain size. The same results were obtained in an investigation of iron-vanadium alloys. This phenomenon is explained as follows: The thermal stresses and the stresses originating during phase transformations place the metal into a state approaching that of

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Interlinkage of the Elements of the Fine Structure of Metal- and Alloy Crystals During Consolidation by Means of Hardening and Plastic Deformation

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maximum deformation. This means that every grain is exposed to the maximum strain which it is capable of sustaining. Similar processes also occur with large plastic deformation. The experiments showed that the differences discovered in the investigation of the fine structure of crystals of steel subjected to different consolidation processes are connected with the fact that in a hardened or deformed alloy the crystal lattice is not in an equilibrium state which it but approaches after drawing. There are 3 figures and 2 Soviet references.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: February 22, 1958

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18.8000

75394
SOV/149-2-5-20/32

AUTHORS: Kagan, A. S., Umanskiy, Ya. S.,

TITLE: Characteristic Temperatures of Cu-Al Alloy in the Temperature Interval 96 to 803°.

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Tsvetnaya metallurgiya, 1959, Vol 2, Nr 5, pp 143-145 (USSR)

ABSTRACT: The conventional method for determination of the characteristic temperature Θ (Debye temperature) according to changes in intensity of X-ray diffraction maxima, is inaccurate owing to considerable distortions found in solid solutions. A discrepancy will be found between Θ determined (a) from the X-ray data and (b) from elasticity modulus. In a previous work by Il'ina, V. A., Kritskaya, V. K., Kurdyumov, G. V., Osip'yan, Yu. A., and Stelletskaya, T. I., Problems of Metal Study and Metal Physics (Problemy metallovedeniya i fiziki metallov), Vol 5, 1958, a conformity is indicated in the changes of Θ and of Young's modulus (E). However, there is a

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disproportion in these changes: if θ of an annealed Fe-Cr alloy differs from θ of a quenched Fe-Cr alloy by 30%, E differs only by 0.5%. Therefore, the authors undertook a determination of the characteristic temperature of a Cu-Al alloy containing 8.8% Al using the radiographic method as well as that of elastic constants. An ingot weighing 0.6 kg was prepared from electrolytic copper and aluminum in a graphite crucible covered with charcoal, cast in an iron mold, cold forged, and homogenized at 1,000° during 4 hr. Nine-mm OD rods were forged from which 5-mm OD 250-mm long rods were machined. These rods were annealed in argon at 700° for 1 hr before measuring their moduli. Specimens for radiographic study at high temperatures were upset in a press and annealed at 580° for 1 hr. For lower temperatures a powder specimen was prepared, after annealing it at 520° for 30 min. The characteristic temperature was determined in accordance with the reflection intensity (changing with the temperature) of lines 331 and 420. A URS-50-I installation and Cu K_{α} radiation were

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used. Readings at high temperatures were taken in a rotating furnace attached to the goniometer. The rotation speed was 1 rpsec. Low-temperature readings were taken in a chamber consisting of a Dewar metal container, the inner section of which was filled with liquid nitrogen. Results were control-checked with those for pure copper. Following values of Θ for Cu-Al alloy were obtained: for the intervals 96-295°, 295-423°, 295-473°, and 295-523° they were 342, 341, 330, and 330° respectively. Θ values at higher temperatures are shown in Fig. 1.

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Characteristic Temperatures of Cu-Al Alloy in the Temperature Interval 96 to 803°.

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Characteristic Temperatures of Cu-Al Alloy in the Temperature Interval 96 to 803°

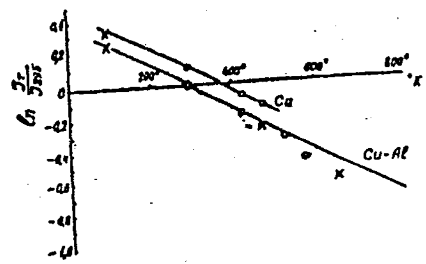

Fig. 1. Logarithm of intensity ratio for lines 331 vs temperature. The curve of Cu is shifted upward by 0.1. Solid lines express theoretical values of Θ = = 315° for Cu and Θ = 341° for Cu-Al).

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Characteristic Temperatures of Cu-Al Alloy in the Temperature Interval 96 to 803°.

Elasticity and stretching moduli E and G were determined in accordance with methods described by Korotkov, V. I., Fizika metallov i metallovedenie, 2, Vol.1, 1956 (Metal Physics and Metal Studies), while the characteristic temperature was determined by the same author in DAN USSR, Nr 5, 108, 1956 (Reports S.S. USSR). The characteristic temperature found by this method was 350°, which coincides fairly well with the radiographic data. While the atomic diameters of Cu and Al differ by 9%, the lattice identity period (when 8.84% Al are dissolved) increases by 1.2%, and the static distortions are low: $\sqrt{\bar{U}^2_{st}} = 0.055$ A. This probably explains the agreement of both results. The help of Korotkov, V. I., candidate of physical & mathematical sciences, for measuring elasticity moduli is acknowledged. There is 1 figure; and 3 Soviet references.

ASSOCIATION: Moscow Steel Institute. Chair of Metal Physics and of Radiography (Moskovskiy institut stali. Kafedra fiziki metallov i rentgenografii)

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75988
SOV/70-4-5-10/36

24.7000

AUTHORS: Belikov, A. M., Umanskiy, Ya. S.

TITLE: Study of the Anisotrophy of the Atomic Thermal Vibrations in Some Amphoteric-Metal Carbides and Diborides Having Hexagonal Structures

PERIODICAL: Kristallofrafiya, 1959, Vol 4, Nr 5, pp 684-686 (USSR)

ABSTRACT: The metal carbides were produced by sintering the compressed mixtures of the powdered metals with carbon black, and diborides by boroncarbide reduction. The X-ray diffraction patterns were taken at various temperatures by copper radiation, except for TiB_2 for which Mo-radiation was employed. The change in the spacing of the diffraction maxima for reflections from the atomic planes normal (or nearly normal) to the a and c axes, and the weakening of the diffraction intensities at higher temperatures furnished the data for computation of the thermal expansion coefficients α_a and α_c and of the characteristic temperatures θ_a and θ_c. The computed figures and the

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Study of the Anistrophy of the Atomic Thermal Vibrations in Some Amphoteric-Metal Carbides and Diborides Having Hexagonal Structures

c:a ratios of the studied compounds are compiled in the table. The experiments disclosed the diminishing of the lattice distortions and increase of a and c at higher temperatures. The difference in α_a and α_c values points to the differing bond energy along the respective axes. The bond energies in diborides proved to be about the same as in the respective carbides. As a general rule, the anistropy of the thermal vibrations in the studied carbides and diborides can, according the authors, be interpreted by the prevalence of Me-X over Me-Me bonds. There is 1 table; and 6 references, 2 German, 1 U.S., 1 British, 1 Soviet, 1 French. The U.S. and British references are: W.H. Zachariasen, F. N. Ellinger, Acta Crystallogr., 8, 7, 431, 1955; I. Thewlis, Acta Crystallogr., 5, 6, 1952.

ASSOCIATION: Moscow Steel Institute imeni I. V. Stalin (Moskovskiy

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Study of the Anistrophy of the Atomic Thermal Vibrations in Some Amphoteric-Metal Carbides and Diborides Having Hexagonal Structures

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institut stali imeni I. V. Stalina)

SUBMITTED: November 19, 1959

Compound c/a	c/a in an ideal structure	State of the Sample	$(m\theta^2)_a$ g·degree^2·10^{18}	$(m\theta^2)_c$ g·degree^2·10^{18}	Temp Range °C	$\alpha_a \cdot 10^{-6}$ degree^{-1}	$\alpha_c \cdot 10^{-6}$ degree^{-1}
Nb_2C 1,601	1,633...	compressed	21,6±4,8	11,5±2,0	190—12	7,0±0,3	8,7±0,4
Nb_2C 1,601	1,633	powder	14,4±3,7*	13,2±2,3	190—17	6,6±3,1	8,6±1,0
W_2C 1,578	1,633	powder	24,6±5,4	18,0±2,7	270—17	5,8±0,2	7,4±0,3
W_2C 1,578	1,633	slide	29,6±6,6	19,3±2,9	400—12	6,4±0,16	8,1±0,22
Mo_2C 1,574	1,633	slide	$(m\theta^2)_a = (m\theta^2)_c$	21,3±4,0	270—17	6,9±0,6	8,9±0,4
Mo_2C 1,574	1,633	powder	..	—	190—12	7,8±0,5	9,3±0,7
ZrB_2	—	slide	$(m\theta^2)_c = (m\theta^2)_c$	34,9	400—17	6,05±0,1	6,8±0,3
ZrB_2	—	slide	—	34,4±5,6	500—17	6,63±0,1	7,35±0,1
WC 0,978	1,0..	slide	$(m\theta^2)_a \approx (m\theta^2)_c$	32,4±4,6	400—22	3,84	3,90
TiB_2	--	slide	$(m\theta^2)_a \approx (m\theta^2)_c$	26	400—17	5,6±0,8	5,1±2,2

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SOV/126-7-1-20/28

AUTHORS: Maslenkov, S.B., Skakov, Yu.A. and Ya.S. Umanskiy

TITLE: Structural Changes in Aluminium Bronze Under the Action of Cold Plastic Deformation and Annealing (Strukturnyye izmeneniya v alyuminiyevoy bronze pod deystviyem kholodnoy plasticheskoy deformatsii i otzhiga)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1959, Vol 7, Nr 1, pp 137-141 (USSR)

ABSTRACT: The structural changes after deformation and annealing of monophase aluminium bronze containing 8.02 wt % (17.1 at %) Al (alloy 1) have been investigated electron-optically and by X-rays. In order to solve auxiliary problems of the investigation an alloy known to be two-phased, containing 12 wt % (25.0 at %) Al (alloy 2), was cast. The ingots were hot forged and were given a homogenizing anneal (900°C, 10 hrs). After annealing alloy 1 at 600°, it was found that $a = 3.645_1 = kX$; this result, as well as that for the lattice parameter of the α-phase in alloy 2 ($a = 3.652$) agrees well with data on the relationship $a = f$ (at % Al) (Ref.6). Thus alloy 1 is in the monophase α-region of

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Structural Changes in Aluminium Bronze Under the Action of Cold Plastic Deformation and Annealing

the existing constitutional diagram. According to electronographic data (Fig.1a and Table on p 140) the lattice parameter of the face-centred cubic solid solution of a specimen of alloy 1, annealed at 600°C, is 3.75 kX. An electron microscope analysis has shown that in this specimen there are, in the vicinity of the grain boundaries, regions rising above the surface of the micro-section, having a width of 0.3 to 0.4 microns, which are difficult to etch (Fig.2a). These regions represent a solid solution (α') with an increased concentration of aluminium and possible other impurities. Comparing this result with the known relationship $a = f$ (at % Al), it can be assumed that the concentration of aluminium in the grain boundary regions of the solid solution is close to the composition of the γ-phase. Deformed specimens give different diffraction pictures, according to the etchant used. After etching in aqua regia, a system of lines of the α solid solution can be seen in the X-ray picture, having a sharply defined texture (Fig.1b). Etching in a mixture of alkalis

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leads to the appearance of a system of diffuse lines, instead of textured ones, in the X-ray photograph (Fig.1f). The interplanar distances are close to those given for the γ-phase (see Table). The electronographic data on the appearance of the γ-phase as a result of cold deformation are in agreement with the photomicrograph shown in Fig.2b. On the basis of microhardness tests after 30 minute annealing at various temperatures (Fig.3a), the authors have chosen for their further investigations a temperature range of 275-300°C for annealing. Annealing at these temperatures leads to a pronounced ordering effect. Microhardness measurements after various annealing times at 275°C (Fig.3b) have shown that the hardness of the alloy is not fully removed after very lengthy soaking (up to 100 hrs). Structural changes on annealing consist, firstly, in an increased structural non-uniformity, and in an increase in the volume of the γ-phase. This is evident from the microstructure. In Fig.2e new slip lines are visible. These are regions in which the γ-phase, or the solid solution of increased aluminium concentration, has separated out.

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Secondly, a basic change in the fine crystalline structure of the solid solution occurs. The lattice parameters of the α-solution in specimens which have been aged for up to 100 hours at 275°C, as well as for 5 hours at 325 - 350°C, differ negligibly from the lattice parameter of an undeformed specimen. There are 3 figures, 1 table and 6 references, of which 5 are Soviet and 1 English.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: April 1, 1957

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18.1220

67767

SOV/126-8-5-20/29

AUTHORS: Kagan, A.S., and Umanskiy, Ya.S.

TITLE: Analysis of the Kinetics of the Two-phase Decomposition of a Cu-Be Alloy by the Electric Resistance Method

PERIODICAL: Fizika metallov i metallovedeniye, Vol 8, 1959, Nr 5, pp 758-760 (USSR)

ABSTRACT: X-ray diffraction studies have shown that a two-phase decomposition takes place in a Cu-Be alloy containing 1.9% Be at temperatures up to 400 °C. This seems to contradict earlier results obtained by one of the authors (Ref 1) and this contradiction is attributed to differences in the quantity of extraneous admixtures in the alloys under investigation, particularly that of nickel. The Ni content of the alloy used in the experiments was 0.1%, whilst the alloy used in the earlier experiments did not contain any nickel. In the present paper the authors attempt to analyse the kinetics of the two-phase decomposition of the super-saturated solid solution of Be in Cu by the electric resistance method. Fig 1 is a plot of the electric conductivity as a function of the ageing time at 350 and 400 °C. It can be seen that, after a certain

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Analysis of the Kinetics of the Two-Phase Decomposition of a Cu-Be Alloy by the Electric Resistance Method

ageing time, the curves calculated by means of the Kurdyumov equation (Ref 2) differ from the experimental curves and this is attributed to the disturbance of the colloidal equilibrium. The authors also calculate the decomposition activation heat Q. Fig 2 is a plot of the logarithmic speed of decomposition as a function of the reciprocal value of the absolute temperature. From the slope of the straight line, the calculated activation energy is 15300 ± 600 cal/mol. Postnikov (Ref 3) found a value of 16000 cal/mol for the same specimens, using the internal friction method. However, Guy, Barrett and Mehl (Ref 4) obtained values of 21000 to 29000 cal/mol; these are attributed to the fact that the values measured by the latter authors represented the activation energy of several superimposed processes. There are 3 figures and 4 references, of which 3 are Soviet and 1 is English.

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SUBMITTED: January 19, 1959

SOV/48-23-5-17/31

24(2)

AUTHORS: Semenovskaya, S. V., Umanskiy, Ya. S.

TITLE: A Comparison of the Fundamental X-Ray Methods for the Determination of the Dimensions of the Mosaic Blocks in Polycrystalline Materials (Sopostavleniye osnovnykh rentgenovskikh metodov opredeleniya razmerov mozaichnykh blokov v polikristallicheskikh materialakh)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 5, pp 620-623 (USSR)

ABSTRACT: The first part of the present paper describes methods and results. The amplification of the last interference lines is measured for the determination of the grain sizes up to 0.1 μ, whereas the primary extinction of the interference lines is determined in the case of grain sizes of 0.1 - 1 μ. Formula (1) by Darwin is given, by which the weakening of the intensity of primary lines may be determined; the size of the structural grains and their quantity are computed in formulas(2) and (3). Sample dimensions and their pre-treatment, as well as the instrument employed for the experiments, are then described. In the thermal treatment importance was attached to the elimination of the tensions of the 2nd kind. A detailed description is then given of the method, in which the grain size may be determined by the aid of formula (1),

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A Comparison of the Fundamental X-Ray Methods for the Determination of the Dimensions of the Mosaic Blocks in Polycrystalline Materials

the error being of 30-7%. Grain sizes of 0.13 - 0.85 μ were measured in this connection. The formula by Selyakov was applied in the determination of the grain sizes by the measurement of the amplification of the last interference lines. The grain sizes measured were of the magnitude of 0.1 - 0.25 μ. The second part of the present paper compares results obtained with different methods. Diagram (Fig 2) reveals that the error in the method by Darwin is lower in the grain size range of 0.1 μ and more, as compared to the method according to Selyakov. In the range of grain sizes smaller than 0.1 μ, Selyakov's method yields better results. It is further shown that the grain sizes obtained from the determination of interference line amplification are smaller as compared to those according to formulas (1), (2), and (3). A comparison is then made of the results obtained with the methods by Darwin, Wilchinsky and Beiss. A diagram depicts the experimental and computed values according to Darwin's method. There are 4 figures and 3 references, 1 of which is Soviet.

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18 (7)

AUTHORS: Pivovarov, L. Kh., Umanskiy, Ya. S. SOV/48-23-5-24/31

TITLE: X-ray Analysis of the Transformations of Mosaic Structure on the Aging of Alloys With Ni-Cr Base (Rentgenoanaliz izmeneniya mozaichnoy struktury pri starenii splava na nikhromovoy osnove)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, , Nr 5, pp 646 - 648 (USSR)

ABSTRACT: By way of an introduction it is pointed out that textural structure exhibits a considerable influence upon the strength properties of metals and their alloys; a number of pertinent papers is referred to in this connection. The present paper investigates the change in the grain sizes with the aging of the alloy EI-437A. The second part accurately describes the chemical composition of the abovementioned alloy. Sample dimensions and thermal treatment are also mentioned. Investigations were carried out with the K_α emission of Cu. The form of the oscillation curve of the reflections (111) was investigated in dependence on the duration of the aging process and the grain sizes. The disorientation of the texture grain was inferred on the strength of these curves. Measuring results concerning the

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X-ray Analysis of the Transformations of Mosaic Structure on the Aging of Alloys With Ni-Cr Base SOV/48-23-5-24/31

original grain size Nr 2 are summarized in a table. According to the latter, the grain size decreases from 3 μ to 0.2 μ after an aging of 50h. The decrease of grain size Nr 4 stops after an aging of 20h. There are 1 figure, 1 table, and 6 Soviet references.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

28(4), 18(7)

S/032/60/026/01/037/052
B010/B006

AUTHORS: Kagan, A. S., Umanskiy, Ya. S.

TITLE: Cameras for the URS-50I Apparatus, Adapted for Photographs at High and Low Temperatures

PERIODICAL: Zavodskaya laboratoriya, 1959, Vol 26, Nr 1, pp 108-109 (USSR)

ABSTRACT: Two cameras intended for use at the URS-50I apparatus are described, which permit X-ray photographs to be taken at high and low temperatures. The camera for high-temperature investigations (Fig 1) consists essentially of a rotating oven, and is fixed to the larger holder of the goniometer. A jacket containing the four heating elements is mounted on the oven. At the free end of the jacket, the sample is held by a copper ring, its temperature being measured by a thermocouple. The emf of the latter is measured potentiometrically. The camera for X-ray photographs at low temperatures (Fig 2) is, essentially, a metal Dewar vessel, the inner wall of which (filled with liquid nitrogen) has a nozzle shaped projection to which the

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